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ESTABLISHMENT REPORT FOR DOUGLAS-FIR TUSSOCK MOTH PERMANENT PLOTS ON THE CLEARWATER NATIONAL FOREST

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INTRODUCTION

Douglas-fir tussock moth, *Orgyia pseudotsugata* McDunnough, outbreaks occur periodically in northern Idaho. Outbreaks in northern Idaho are synchronized more than 50 percent of the time with larger scale western outbreaks. The Palouse Ranger District (RD) on the Clearwater National Forest has had four recorded outbreaks since 1944 including the most recent outbreak (Sturdevant 2000, Randall 2001, Randall 2002). The next previous outbreak occurred in 1986. During the most recent outbreak, 142,000 acres were defoliated at its peak in 2001 (Kegley and Wulff 2003).

Though outbreaks usually last for only 2-4 years, severe defoliation can cause growth loss, top kill, or tree mortality. Growth loss and tree mortality have been documented for outbreaks in Oregon and California (Wickman 1978 and 1980) and for one outbreak on the Nez Perce National Forest in northern Idaho (Bousfield and Ward 1976). There have been no studies that have evaluated the effects of tussock moth on mature and immature grand fir and Douglas-fir forests throughout an entire outbreak cycle in northern Idaho.

After the outbreak in 1986, permanent plots were established on the Palouse RD in 1992. The objective of establishing permanent plots were to measure growth loss, top kill, and tree mortality in affected tussock moth areas and to observe forest changes as a result of tussock moth activity. As forest management objectives change, how we view the results of an outbreak may also change. Therefore, it is more important than ever to focus on the vegetation changes as a result of outbreaks versus the insects and their damage.

METHODS

1992 plots

Plots were established in 1992 in 4 stands. These were mature stands with a high component of grand fir and Douglas-fir and were not scheduled for harvest for several decades. Selected stands varied in habitat type, aspect and basal area. Stands were similar in topography, slope and elevation (Table 1).



Table 1. Stand characteristics for Douglas-fir tussock moth plots established in 1992.

| Location | Skyline | Mission Mtn. | Giant White Pine | Blakes Fork |
|------------------|------------|--------------|------------------|-------------|
| # of plots | 10 | 10 | 10 | 10 |
| Habitat type | 591 | 505 | 571 | 508 |
| Stand aspect | SW | W | NW | SW |
| Elevation | 2500 | 2500 | 3000 | 3200 |
| Topography | Even slope | Even slope | Even slope | Even slope |
| Ave. BA per plot | 222 | 317 | 211 | 170 |
| Slope | 23 | 33 | 32 | 27 |

A series of 10-variable radius (using 40 BAF) and 1/100 acre fixed plots were established in each stand. Region One timber stand exam procedures were used (Timber Management Data Handbook 1991). Data recorded on variable radius plots were number of trees, plot slope, aspect, habitat type, and basal area. Data collected on individual trees included species, diameter at breast height (d.b.h), tree class, tree height, crown ratio, crown class, and tree damage. Site trees were selected and measured for each stand. On fixed plots, grand fir and Douglas-fir regeneration were measured and recorded. In addition, five-saplings, at least 1 foot in height, were permanently tagged on each fixed plot. Data on cover type, % cover, brush height was also recorded on fixed plots.

Top-kill and defoliation was measured for all mature tagged trees and the five saplings permanently tagged. Top-kill was measured as a percentage of crown killed. Defoliation for both large trees and tagged regeneration was measured by crown thirds and in percentages of 10. Defoliation was measured annually through 1994. Five pheromone traps for Douglas-fir tussock moth were placed in each stand between 1992 and 1994. In 1997, 5 years after establishment, height, d.b.h., and defoliation on mature trees in the variable radius plots were remeasured. Height and defoliation of the tagged regeneration was also remeasured.

2001 Plots

The outbreak that occurred from 2000-2002 was very large and severe. However, permanent plots we established in 1992 experienced only light to moderate defoliation during the 2000-2002 outbreak. In order to obtain information on severely defoliated sites and on immature stands, additional plots were established in 2001.

In October and November 2001, plots were established in a heavily defoliated plantation and in a surrounding mature stand east of Prospect Peak off of road 4709 on the Palouse RD. In the plantation, seven 1/50th acre fixed radius plots were established 2 chains apart. A total of 101 Douglas-fir and grand fir were tagged and the following data collected: species, d.b.h., and percent defoliation. Height was recorded only on the first 5 trees in each plot. Douglas-fir and grand fir were the only tree species in the plantation plots.

In the mature stand adjacent to the plantation, 19 variable radius plots were established using a 20 basal area factor prism. Data taken was similar to plots established in 1992.

Stand Summaries

| Location | Rd.4709 Mature Stand | Rd.4709 Plantation | Skyline Drive | Mission Mountain | Giant White Pine | Blake's Fork |
|-------------|-------------------------|-----------------------|------------------|---------------------|---------------------|-----------------|
| TPA of DF * | 22.92 | 278.57 | 18.73 | 16.55 | 16.11 | 64.02 |
| QMD DF | 22.2 | 5.24 | 19.07 | 20.85 | 14.38 | 16.58 |
| % BA of DF | 20 | 42 | 31 | 21 | 14 | 80 |
| TPA of GF | 117.67 | 442.86 | 81.50 | 72.45 | 64.03 | 28.98 |
| QMD GF | 15.76 | 3.58 | 11.56 | 17.35 | 13.33 | 9.51 |
| % BA of GF | 50 | 58 | 57 | 61 | 39 | 9 |
| TPA Larch | 62.89 | 0 | 0.84 | 6.67 | 9.57 | 4.9 |
| QMD Larch | 13.20 | 0 | 20.9 | 15.45 | 20.65 | 12.25 |
| % BA Larch | 19 | 0 | 2 | 5 | 14 | 4 |
| TPA WWP | 0.89 | 0 | 0 | 0 | 3.14 | 0 |
| QMD WWP | 14.7 | 0 | 0 | 0 | 10.80 | 0 |
| % BA WWP | 0.5 | 0 | 0 | 0 | 2 | 0 |
| TPA PP | 4.29 | 0 | 3.91 | 5.87 | 2.73 | 3.27 |
| QMD PP | 23.86 | 0 | 21.66 | 23.85 | 11.60 | 24.07 |
| % BA PP | 5 | 0 | 10 | 10 | 2 | 7 |
| TPA WRC | 9.15 | 0 | 0 | 0 | 11.67 | 0 |
| QMD WRC | 17.66 | 0 | 0 | 0 | 18.55 | 0 |
| % BA WRC | 5 | 0 | 0 | 0 | 16 | 0 |
| TPA WH | 0 | 0 | 0 | 0 | 12.54 | 0 |
| QMD WH | 0 | 0 | 0 | 0 | 15.24 | 0 |
| % BA WH | 0 | 0 | 0 | 0 | 13 | 0 |
| TPA Birch | 0 | 0 | 0 | 11.77 | 0 | 0 |
| QMD Birch | 0 | 0 | 0 | 7.89 | 0 | 0 |
| % BA Birch | 0 | 0 | 0 | 3 | 0 | 0 |
| Total TPA | 218 | 721 | 105 | 113 | 120 | 101 |
| Total BA | 237 | 68 | 102 | 154 | 112 | 92 |

* TPA = trees per acre, QMD = quadratic mean diameter of live trees, BA = basal area
 DF = Douglas-fir, GF = grand fir, L = larch, WWP = western white pine, PP = ponderosa pine, WRC = western red cedar,
 WH = western hemlock.

In 2001, defoliation, top-kill, and mortality were measured for all trees on all plots. This data was taken again in 2002, along with a 10-year remeasurement of d.b.h and heights of all trees on the 1992 plots. A summary of this data will be available after a 2003 measurement of defoliation, top-kill, and mortality.

We expect very little, if any, tussock moth activity after 2003 for several years. Five years following the recent outbreak, in 2007, we hope to evaluate the long-term growth effects of tussock moth on host trees on all plots. We will also measure the effects on subsequent growth and survival of non-host trees.

REFERENCES

- Bousfield, W.E. and J. D. Ward. 1976. Observations of impact on the Nezperce National Forest caused by the Douglas-fir tussock moth. USDA Forest Service, Northern Region, State and Private Forestry, Missoula, MT 59801. Report 76-9.
- Kegley, S. and Wulff, D. 2003. 2002 North Idaho Douglas-fir Tussock Moth Trapping System Report. USDA Forest Service Northern Region, State and Private Forestry, Missoula, MT. FHP Report 03-5.
- Randall, C. 2001. Douglas-fir tussock moth biological evaluation, Palouse Ranger District, Clearwater National Forest-2000. USDA Forest Service, State and Private Forestry, Missoula, MT. FHP Report 01-4. 30 p.
- Randall, C. 2002. Douglas-fir tussock moth biological evaluation, Palouse Ranger District, Clearwater National Forest-2001. USDA Forest Service, State and Private Forestry, Missoula, MT. FHP Report 02-5. 33 p.
- Sturdevant, N. J. 2000. Douglas-fir tussock moth in Northern Idaho and Western Montana: Current Activity and Historical Patterns. USDA Forest Service, Northern Region, State and Private Forestry, Forest Health Protection, Missoula, MT 59801. Report No. 00-12.
- Timber Management Data Handbook. 1991. Field Instructions. Stand Examination. FSH 2409.21h R1 Chapter 400
- Wickman, B. E. 1980. Increased growth of white fir after a tussock moth outbreak. J. Forestry. 78:31-35.
- Wickman, B. E. 1978. Tree mortality and top-kill related to defoliation by the Douglas-fir tussock moth in the Blue mountain outbreak. USDA Forest Service research paper PNW-233.